ACTA ARACHNOL., 40: 75-84, December 25, 1991

Oribatid Mites of High Altitude Forests of Taiwan I. Mt. Pei-ta-wu Shan

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青木淳一[1)]：台湾高地森林のササラダニ類. I. 北大武山

Abstract: Twenty-eight species of oribatid mites were collected from high altitude forests of Mt. Pei-ta-wu Shan in the southern part of Taiwan. Among them, *Cepheus takasago* sp.n., *Defectamerus crassisetiger australis* subsp.n., *Dolicheremaeus infrequens taiwanus* subsp.n. and *Parachipteria distincta incurva* subsp.n. were described.

The first intensive investigation of the oribatid mites of Taiwan was made by TSENG (1982, 1984), who reported 76 species belonging to 28 families from the island. Later, "expedition of soil fauna" was made by Japanese soil zoologists (Leader: Prof. H. TAMURA) and, as a part of the result, AOKI (1990) described some new forms of the mites from around Lu-shan Hotspring in the central part of Taiwan. However, the oribatid fauna of the high altitude zone in Taiwan still remains mostly unknown.

In 1990, as a member of the National Research Project "Zoogeographic Study on the Derivation and Characteristics of the High Altitude Fauna of Taiwan (Head: Dr. Shun-Ichi UÉNO)", the author had a chance to collect oribatid mites in the high altitude forests of three high mountains in Taiwan. The result of his study will be reported in three parts: I. Mt. Pei-ta-wu Shan, II. Mt. Hsiu-ku-luan Shan, and III. Mt. Nan-hu-ta Shan. In the series of study the collection was restricted to places higher than 2,000 m above sea-level.

Lacking in electricity in the mountains, use of Tullgren funnels requires other heat sources. Some attempts were made to dry out litter samples, exposing the funnels to the sun, placing the funnels near fire, and putting burning charcoal on the funnels. However, these attempts were found not always successful and ineffective for drying out the material within a short time to extract most animals. Litter samples collected in the later half of each mountain trip were brought to hotels and treated by small portable Tullgren funnels, though only a small amount of litter was subjected. This was found to be more effective than the methods without electricity.

Because the oribatid species thus collected from each sampling station do not seem to

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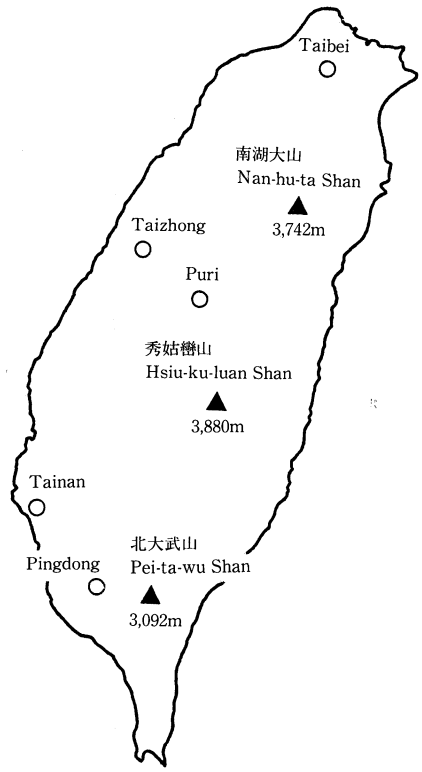


Fig. 1 Map showing the location of the three mountains where the collections of oribatid mites were made.

represent true species composition of the habitat, no discussion will be made here on the relation between vegetation and oribatid fauna. Only an ecologically noticeable fact is that in the high altitude forests of Taiwanese mountains, certain species which have never found together in Japan coexist in the same habitat. In the Japanese Archipelago, some of them are considered alpine, while some others are believed subtropical.

Before going further, the author wishes to express his sincere gratitude to Dr. Shun-Ichi UÉNO of the National Science Museum, Tokyo, for his valuable advice and reading the manuscript.

Collecting Data

TWP-8: Near Kuai-ku, Mt. Pei-ta-wu Shan, 2,200 m, 17-X-1990. J. AOKI. Moss growing on rock.

TWP-9: Kuai-ku, Mt. Pei-ta-wu Shan, 2,070 m, 17-X-1990. J. AOKI. Litter of *Chamaecyparis formosensis.*

TWP-16: Mt. Pei-ta-wu Shan, 2,540 m, 18-X-1990. J. AOKI. Shifted material of litter of *Tsuga chinensis* var. *formosana.*

TWP-17: Mt. Pei-ta-wu Shan, 2,640 m, 18-X-1990. J. AOKI. Brushing material under bark of rotten tree of *Tsuga chinensis* var. *formosana.*

TWP-18: Mt. Pei-ta-wu Shan, 2,780 m, 18-X-1990. J. AOKI. Litter of *Tsuga chinensis* var. *formosana* and *Arundinaria niitakayamensis.*

TWP-19: Mt. Pei-ta-wu Shan, 2,640 m, 18-X-1990. J. AOKI. Shifting material of litter of *Tsuga chinensis* var. *formosana* and *Arundinaria niitakayamensis.*

TWP-20: Mt. Pei-ta-wu Shan, 2,860 m, 18-X-1990. J. AOKI. Shifted material of *Tsuga chinensis* and *Arundinaria niitakayamensis* accumulated on rocky place.

TWP-21: Mt. Pei-ta-wu Shan, 2,900 m, 18-X-1990. J. AOKI. Litter of alpine shrub.

List of Species Found

Family Phthiracaridae

1. *Phthiracarus japonicus* AOKI, 1958
   6 exs. TWP-19
2. *Hoplophthiracarus* sp.
   1 ex. TWP-8, 1 ex. TWP-18

Family Camisiidae

3. *Camisia spinifer* (C.L. KOCH, 1836)
   3 exs. TWP-21
4. *Heminothrus peltifer* (C.L. KOCH, 1839)
   1 ex. TWP-19

Family Plateremaeidae

5. *Pedrocortesia* sp.
   1 ex. TWP-17

Family Licnodamaeidae

6. *Licnodamaeus undulatus* (PAOLI, 1908)
   1 ex. TWP-8

Family Cepheidae

7. *Cepheus takasago* sp. n.
   2 exs. TWP-20
8. *Conoppia palmicincta* (MICHAEL, 1884)
   1 ex. TWP-9, 1 ex. TWP-16

Family Ameridae

9. *Defectamerus crassisetiger australis* subsp.n.
   1 ex. TWP-16, 1 ex. TWP-18, 1 ex. TWP-19, 1 ex. TWP-20, 1 ex. TWP-21

Family Zetorchestidae

10. *Zetorchestes* sp.
1 ex. TWP-8

Family Liacaridae

11. *Liacarus orthogonios* AOKI, 1959
2 exs. TWP-16, 9 exs. TWP-19, 1 ex. TWP-21

Family Metrioppiidae

12. *Ceratoppia bipilis* (HERMANN, 1804)
3 exs. TWP-20
13. *Austroceratoppia japonica* AOKI, 1984
5 exs. TWP-16, 1 ex. TWP-19

Family Carabodidae

14. *Carabodes* sp.
1 ex. TWP-17

Family Niphocepheidae

15. *Niphocepheus nivalis* (SCHWEIZER, 1922)
1 ex. TWP-8

Family Otocepheidae

16. *Dolicheremaeus infrequens taiwanus* subsp. n.
1 ex. TWP-16

Family Oppiidae

17. *Arcoppia arcualis* (BERLESE, 1913)
1 ex. TWP-16

Family Suctobelbidae

18. *Suctobelbella singularis* (STRENZKE, 1950)
1 ex. TWP-18

Family Oribatulidae

19. *Zygoribatula truncata* AOKI, 1961
2 exs. TWP-17

Family Xylobatidae

20. *Xylobates* sp.
1 ex. TWP-9

Family Haplozetidae

21. *Haplozetes* sp.
1 ex. TWP-18, 8 exs. TWP-19
22. *Incabates major* AOKI, 1970
7 exs. TWP-17

Family Scheloribatidae

23. *Scheloribates* sp.
1 ex. TWP-8, 1 ex. TWP-16

Family Ceratozetidae

24. *Ceratozetes* sp.
1 ex. TWP-8

Family Pelopidae

25. *Eupelops* sp.
1 ex. TWP-16, 1 ex. TWP-19, 3 exs. TWP-20, 3 exs. TWP-21

Family Achipteriidae

26. *Achipteria* (*Izuachipteria*) *imperfecta* SUZUKI, 1972
1 ex. TWP-8
27. *Parachipteria distincta incuva* subsp. n.
5 exs. TWP-17

Family Parakalummidae

28. *Neoribates rotundus* AOKI, 1982
2 exs. TWP-21

Description of New Taxa

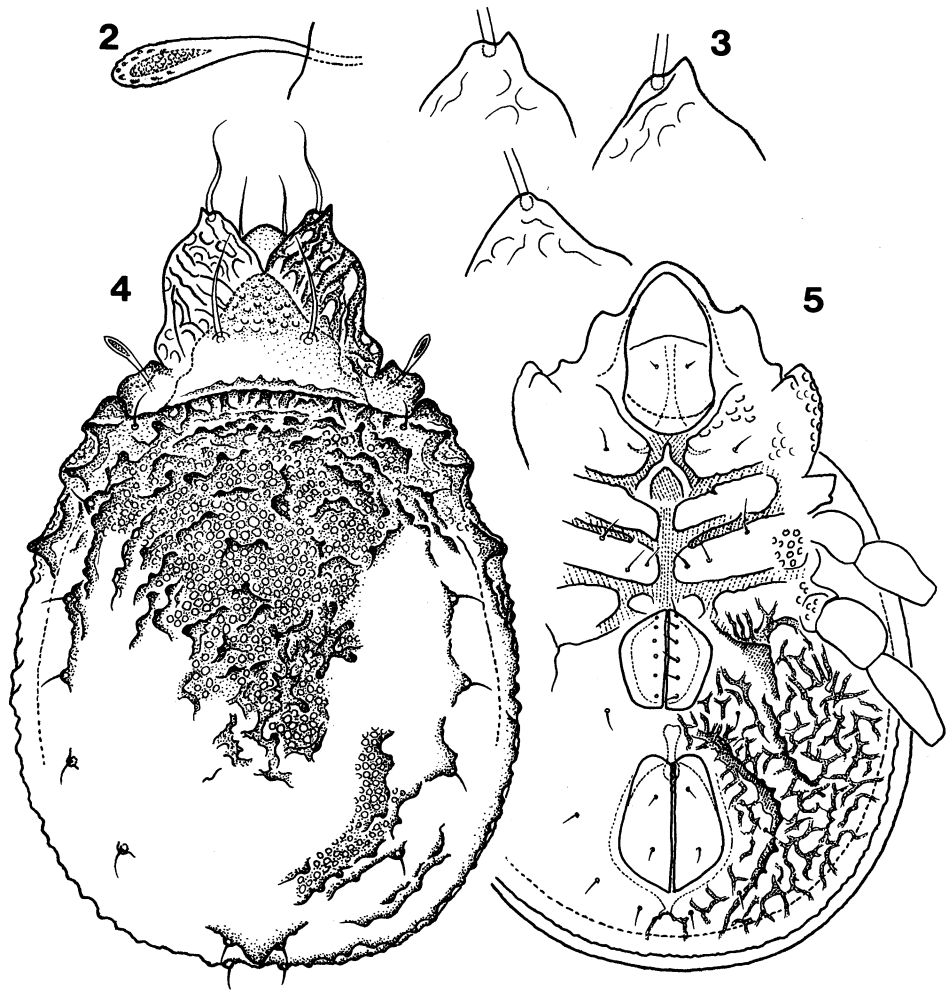
Cepheus takasago sp. n.
(Figs. 2–5, 8)

Measurement. Body length 740–760 μm; body width 530–540 μm.

Prodorsum. Lamellae broad, strongly swelling laterally, the surface being sculptured with irregular furrows and foveolae; lamellar cusp provided with a small outer tooth (Fig. 3 the upper two) or rounded (Fig. 3 bottom). Rostrum visible from above between lamellar cusps. Lamellar seta thick proximally, sharply attenuating apically. Interlamellar seta as long and thick as lamellar seta. Rostral seta distinctly shorter than setae *le* and *in*. Surface of prodorsum between lamellae foveolate in front of lamellar setae. Sensillus clavate, directed anterolaterally, head only slightly roughened with small warts.

Notogaster. A little longer than wide. Humeral part on each side provided with a rounded anterior projection and three triangular lateral projections. Surface sculpture consisting of small foveolae and irregular ridges of somewhat dark color (Fig. 8). Seven pair of setae arranged submarginally, each on a small apophysis.

Ventral side. Genital aperture pentagonal, with 6 pairs of short genital setae. Anal aperture wider posteriorly, with 2 pairs of short setae. Adanal seta ad_3 inserted in a level between an_1 and an_2. Ventral plate sculptured with a network of irregular ridges, being partly fused to form several stronger ridges. Epimerata foveolate in part. Anterior portion of sternal ridge divided,

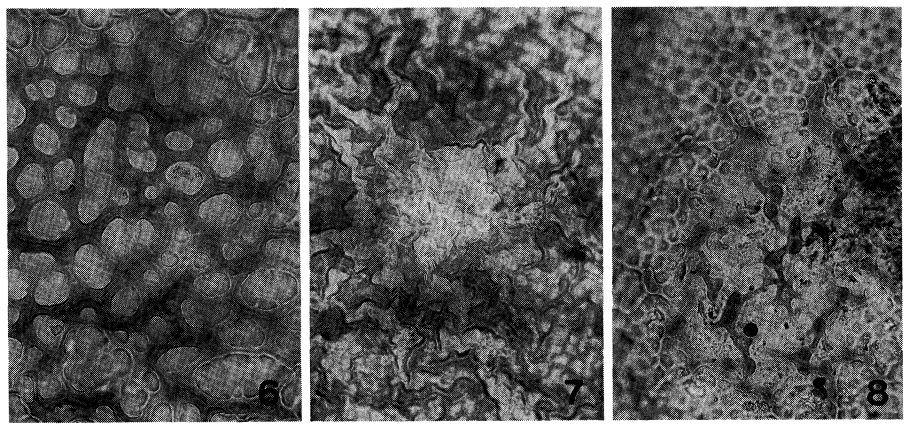


Figs. 2–5 *Cepheus takasago* sp. n. 2: Sensillus. 3: Variation of lamellar cusps. 4: Dorsal side. 5: Ventral side.

surrounding a bell-shaped median thickening. All legs monodactyle.

Type series. Holotype (NSMT-Ac 10233, in spirit) and paratype (on slide): Mt. Pei-ta-wu Shan, 2860 m, South Taiwan. 18-X-1990. J. AOKI. Litter of *Tsuga chinensis* and *Arundinaria niitakayamensis* accumulated on a rocky place [TWP-20].

Remarks. The new species is related to *Cepheus cepheiformis* (NICOLET, 1855) and *C. latus* (C.L. KOCH, 1836), but readily distinguishable from them by the lamellae which are strongly swollen laterally and the sensilli without apical barbation. The three species are also different from each other in the surface sculpture as shown in Figs. 6–8.



Figs. 6–8 Surface sculptures on the central part of notogaster. 6: *Cepheus latus* (C.L. KOCH). 7: *Cepheus cepheiformis* (NICOLET). 8: *Cepheus takasago* sp. n. (×250)

Defectamerus crassisetiger australis subsp.n.
(Fig. 9)

Measurement. Body length 578(597)625 μm; body width 346(375)394 μm.

In the genus *Defectamerus* AOKI, 1984, the two species, *D. crassisetiger* AOKI, 1984 and *D. soonkii* CHOI et AOKI, 1985, have hitherto been known and the former species was divided into two subspecies, *D. crassisetiger crassisetiger* AOKI, 1984 and *D. crassisetiger coreanus* CHOI et AOKI, 1985.

The new subspecies is distinguishable from the nominate subspecies, *D. c. crassisetiger,* by far longer and smooth notogastral setae, especially setae *te* which are longer than notogaster, and from the korean subspecies, *D. c. coreanus,* by smooth notogastral setae, especially setae r_1 distinctly longer than r_2, and also lamellar ridges strongly arched. From the other korean species, *D. soonkii,* the new subspecies is different in the number of notogastral setae, 8 pairs instead of 9.

Type series. Holotype (NSMT-Ac 10235): Mt. Pei-ta-wu Shan, 2860 m. 18-X-1990. J. AOKI. Litter of *Tsuga chinensis* var. *formosana* and *Arundinaria niitakayamensis* [TWP-20]; 4 paratypes: Mt. Pei-ta-wu Shan, 2540–2900 m. 18-X-1990. J. AOKI. Litter of *Arundinaria niitakayamensis* and alpine shrub.

Dolicheremaeus infrequens taiwanus subsp. n.
(Figs. 10–12)

Measurement. Body length 1050 μm; body width 440 μm.

Under the species *Dolicheremaeus infrequens* AOKI, 1967, the two subspecies have been

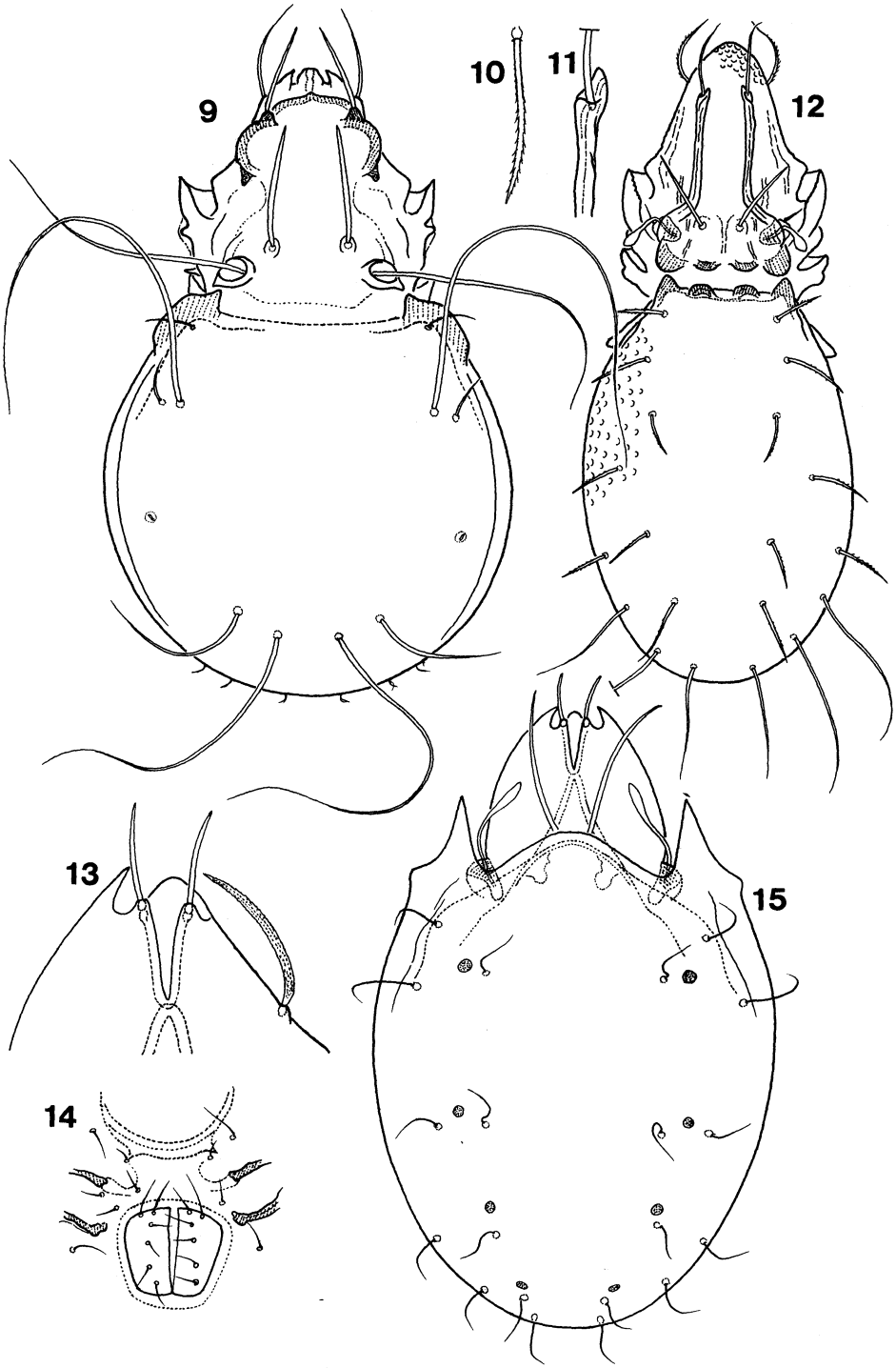

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Table 1 Comparison in length of notogastral setae among the subspecies of *Dolicheremaeus infrequens* AOKI. Figures in the table show RLN (relative length to notogaster).

	ta	*te*	*ti*	*ms*	r_1	r_2	r_3	p_1	p_2	p_3
D. infrequens infrequens	23	27	27	39	62	66	49	58	59	61
D. infrequens hachijoensis	23	28	27	29	31	31	33	36	44	44
D. infrequens amamiensis	29	45	49	58	61	63	61	65	63	55
D. infrequens taiwanus	19	23	22	19	15	16	15	27	40	38

known: *D. infrequens hachijoensis* AOKI, 1967 from Hachijo Island and *D. infrequens amamiensis* AOKI, 1982 from Amami-Ohshima Island. The new subspecies differs from the known subspecies including the nominate one in the markedly shorter notogastral setae. As shown in Table 1 the setae *ms* and setae of *r*-series (r_1, r_2 and r_3) are distinctly shorter in the new subspecies than in the remaining subspecies. These short setae are rather blunt at tip and barbed (Fig. 10).

Holotype (NSMT-Ac 10240): Mt. Pei-ta-wu Shan, 2540 m. 18-X-1990. J. AOKI. Shifted material of litter of *Tsuga chinensis* var. *formosana* [TWP-16].

Parachipteria distincta incurva subsp. n.
(Figs. 13–15)

Measurement. Body length 348(364)385 μm: body width 230(245)262 μm.

The new subspecies is different from the nominate subspecies, *Parachipteria distincta distincta* (AOKI, 1959) in (1) the lamellar cusps strongly curved inward, (2) the rostral, lamellar and interlamellar setae not sharply pointed at tip, but rather blunt at tip, and (3) the body size smaller than that of the nominate subspecies (the body length 390–420 μm; width 280–300 μm).

Type series. Holotype (NSMT-Ac 10241): Mt. Pei-ta-wu Shan, 2,640 m. 18-X-1990. J. AOKI. Brushing material under bark of rotten tree of *Tsuga chinensis* var. *formosana* [TWP-17].

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Figs. 9–15 Three new subspecies. 9: *Defectamerus crassisetiger australis* subsp. n., dorsal side. 10–12: *Dolicheremaeus infrequens taiwanus* subsp. n. 10: Notogastral seta r_3. 11: Anterior part of lamella (left side). 12: Dorsal side. 13–15: *Parachipteria distincta incurva* subsp. n. 13: Anterior part of prodorsum, showing lamellar cusp on the left side and rostral seta on the right side. 14: Genital aperture and its vicinity. 15: Dorsal side.

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